

**Amendments to the Claims:**

Please add claims 1-6 to this application, as shown below.

1. (NEW) A system for detecting atmospheric dust comprising:

A means for collecting multispectral optical-spectrum imagery having at least a first, second, third fourth, fifth, sixth and seventh channel wherein each channel relates to a unique wavelength,

a processor operatively coupled to the collection means, wherein the processor receives the multispectral optical-spectrum imagery and processes the digital data by:

performing a numerical atmospheric correction for removal of molecular scatter within all of the visible-spectrum channels, based on radiative transfer calculations stored in pre-computed look-up tables and indexed as a function of solar and sensor geometry,

determining the pixel background for each pixel of the image by combining known earth location with a terrestrial database,

employing a background-dependent algorithm to compute the dust enhancement variable ***D***,

means for displaying the multispectral imagery coupled to the processor, wherein the means for displaying the multispectral imagery comprises a red, blue and green color gun for displaying the visible light spectrum via a hue/saturation decomposed color technique,

creating a false color composite by loading the background-dependent ***D*** variable into the red color gun, loading log-scaled percent-reflectance (and subsequently byte-scaled between [0,255] for values falling within [-1.45, 0.0]) into the blue and green color guns of said composite, wherein the resultant imagery rendered depicts atmospheric dust as visually enhanced in red/pink tonalities.

2. (NEW) The system of claim 1 whereby when a pixel is determined to have a ***water*** background, ***D=D<sub>wat</sub>*** and the processor calculates the log-scaled normalized difference (***D<sub>wat</sub>***) between the channel 2 and 3 reflectivities according to the relation:

$$D_{\text{wat}} = \log_{10} \left( \frac{R_2 - R_3}{R_2 + R_3} \right),$$

byte-scaling this quantity over the range [-0.40, 0.15], where the bidirectional reflection function ( $R_k \in [0, 1]$ ) at channel ( $k$ ) is expressed in terms of channel radiance ( $I_k$ ) as:

$$R_k = \frac{\pi I_k}{\mu_o F_{o,k}}$$

and  $\mu_o$  and  $F_{o,k}$  are the cosine of the solar zenith angle and band-weighted solar spectral flux, respectively,

3. (NEW) The system of claim 1 whereby when a pixel is determined to have a *land* background,  $D=D_{\text{ind}}$  and the processor calculates the multivariate quantity ( $D_{\text{ind}}$ ) according to the relation:

$$D_{\text{ind}} = L1 + L3 - L4 + (1.0 - L2)$$

byte-scaled over the range [1.3, 2.7], where:

$$\begin{aligned} L1 &= T(7) - T(6), \text{ byte-scaled over the range } [-2, 2] \\ L2 &= T(6), \text{ byte-scaled over the range } [T_{\text{dyn}}, T_{\text{max}}(6)] \\ L3 &= 2R(1) - R(3) - R(4) - 1.2, \text{ byte-scaled over the range } [-1.5, 0.25] \\ L4 &= R(5) > 0.05 ? 0, \text{ else } 1, \text{ (no byte-scaling applied)} \end{aligned}$$

Where  $T(x)$  are brightness temperatures as measured at channel (x), and the dynamic temperature range ( $T_{\text{dyn}}(6), T_{\text{max}}(6)$ ) used in the L2 term byte-scaling is defined by:

$$T_{\text{dyn}}(6) = \begin{cases} T_{\text{max}}(6) - 21 & \text{if } (T_{\text{max}}(6) < 301K) \\ (T_{\text{max}}(6) - 273)/4 + 273 & \text{otherwise,} \end{cases}$$

and  $T_{\text{max}}(6)$  is the maximum temperature detected (in kelvins) at a channel 6 for the current scene.

4. (NEW) The system of claim 2 wherein channel 1 has a central wavelength of approximately 0.645  $\mu\text{m}$ , channel 2 has a central wavelength of approximately 0.853  $\mu\text{m}$ , channel 3 has a central wavelength of approximately 0.469  $\mu\text{m}$ , and channel 4 has a central wavelength of approximately 0.555  $\mu\text{m}$ .

5. (NEW) The system of claim 3 wherein channel 1 has a central wavelength of approximately 0.645  $\mu\text{m}$ , channel 2 has a central wavelength of approximately 0.853  $\mu\text{m}$ , channel 3 has a central wavelength of approximately 0.469  $\mu\text{m}$ , and channel 4 has a central wavelength of approximately 0.555  $\mu\text{m}$ , channel 5 has a central wavelength of approximately 1.38  $\mu\text{m}$ , channel 6 has a central wavelength of approximately 11.0  $\mu\text{m}$ , and channel 7 has a central wavelength of approximately 12.0  $\mu\text{m}$ .

6. (NEW) A system for detecting atmospheric dust comprising:

means for collecting multispectral optical-spectrum imagery having at least a first, second, third fourth, fifth, sixth and seventh channel wherein each channel relates to a unique wavelength,

a processor operatively coupled to the collection means, wherein the processor receives the multispectral optical-spectrum imagery and processes the digital data by:

performing a numerical atmospheric correction for removal of molecular scatter within all of the visible-spectrum channels, based on radiative transfer calculations stored in pre-computed look-up tables and indexed as a function of solar and sensor geometry,

determining the pixel background for each pixel of the image by combining known earth location with a terrestrial database,

employing a background-dependent algorithm to compute the dust enhancement variable  $D$ ,

wherein when a pixel is determined to have a *water* background,  $D=D_{\text{wat}}$  and the processor calculates the log-scaled normalized difference ( $D_{\text{wat}}$ ) between the channel 2 and 3 reflectivities according to the relation:

$$D_{\text{wat}} = \log_{10} \left( \frac{R_2 - R_3}{R_2 + R_3} \right),$$

byte-scaling this quantity over the range [-0.40, 0.15], where the bidirectional reflection function ( $R_k \in [0, 1]$ ) at channel ( $k$ ) is expressed in terms of channel radiance ( $I_k$ ) as:

$$R_k = \frac{\pi I_k}{\mu_o F_{o,k}}$$

and  $\mu_o$  and  $F_{o,k}$  are the cosine of the solar zenith angle and band-weighted solar spectral flux, respectively,

wherein when a pixel is determined to have a *land* background,  $D=D_{\text{Ind}}$  and the processor calculates the multivariate quantity ( $D_{\text{Ind}}$ ) according to the relation:

$$D_{\text{Ind}} = L1 + L3 - L4 + (1.0 - L2)$$

byte-scaled over the range [1.3, 2.7], where:

$$\begin{aligned} L1 &= T(7) - T(6), \text{ byte-scaled over the range } [-2, 2] \\ L2 &= T(6), \text{ byte-scaled over the range } [T_{\text{dyn}}, T_{\text{max}}(6)] \\ L3 &= 2R(1) - R(3) - R(4) - 1.2, \text{ byte-scaled over the range } [-1.5, 0.25] \\ L4 &= R(5) > 0.05 ? 0, \text{ else } 1, \text{ (no byte-scaling applied)} \end{aligned}$$

where  $T(x)$  are brightness temperatures as measured at channel (x), and the dynamic temperature range ( $T_{\text{dyn}}(6), T_{\text{max}}(6)$ ) used in the L2 term byte-scaling is defined by:

$$T_{\text{dyn}}(6) = \begin{cases} T_{\text{max}}(6) - 21 & \text{if } (T_{\text{max}}(6) < 301K) \\ (T_{\text{max}}(6) - 273)/4 + 273 & \text{otherwise,} \end{cases}$$

and  $T_{\text{max}}(6)$  is the maximum temperature detected (in kelvins) at a channel 6 for the current scene.

7. (NEW) A system for detecting atmospheric dust comprising:

means for collecting multispectral optical-spectrum imagery having at least a first, second, third fourth, fifth, sixth and seventh channel wherein each channel relates to a unique wavelength,

a processor operatively coupled to the collection means, wherein the processor receives the multispectral optical-spectrum imagery and processes the digital data by:

performing a numerical atmospheric correction for removal of molecular scatter within all of the visible-spectrum channels, based on radiative transfer calculations stored in pre-computed look-up tables and indexed as a function of solar and sensor geometry,

determining the pixel background for each pixel of the image by combining known earth location with a terrestrial database,

employing a background-dependent algorithm to compute the dust enhancement variable  $D$ ,

wherein when a pixel is determined to have a *water* background,  $D=D_{\text{wat}}$  and the processor calculates the log-scaled normalized difference ( $D_{\text{wat}}$ ) between the channel 2 and 3 reflectivities according to the relation:

$$D_{\text{wat}} = \log_{10} \left( \frac{R_2 - R_3}{R_2 + R_3} \right),$$

byte-scaling this quantity over the range  $[-0.40, 0.15]$ , where the bidirectional reflection function ( $R_k \in [0, 1]$ ) at channel (k) is expressed in terms of channel radiance ( $I_k$ ) as:

$$R_k = \frac{\pi I_k}{\mu_o F_{o,k}}$$

and  $\mu_o$  and  $F_{o,k}$  are the cosine of the solar zenith angle and band-weighted solar spectral flux, respectively,

wherein when a pixel is determined to have a *land* background,  $D=D_{\text{Ind}}$  and the processor calculates the multivariate quantity ( $D_{\text{Ind}}$ ) according to the relation:

$$D_{\text{Ind}} = L1 + L3 - L4 + (1.0 - L2)$$

byte-scaled over the range [1.3, 2.7], where:

$L1 = T(7) - T(6)$ , byte-scaled over the range [-2,2]

$L2 = T(6)$ , byte-scaled over the range [ $T_{\text{dyn}}$ ,  $T_{\text{max}}(6)$ ]

$L3 = 2R(1) - R(3) - R(4) - 1.2$ , byte-scaled over the range [-1.5,0.25]

$L4 = R(5) > 0.05 ? 0$ , else 1, (no byte-scaling applied)

where  $T(x)$  are brightness temperatures as measured at channel (x), and the dynamic temperature range ( $T_{\text{dyn}}(6)$ ,  $T_{\text{max}}(6)$ ) used in the  $L2$  term byte-scaling is defined by:

$$T_{\text{dyn}}(6) = \begin{cases} T_{\text{max}}(6) - 21 & \text{if } (T_{\text{max}}(6) < 301K) \\ (T_{\text{max}}(6) - 273)/4 + 273 & \text{otherwise,} \end{cases}$$

and  $T_{\text{max}}(6)$  is the maximum temperature detected (in kelvins) at a channel 6 for the current scene,

means for displaying the multispectral imagery coupled to the processor, wherein the means for displaying the multispectral imagery comprises a red, blue and green color gun for displaying the visible light spectrum via a hue/saturation decomposed color technique,

creating a false color composite by loading the background-dependent  $D$  variable into the red color gun, loading log-scaled percent-reflectance (and subsequently byte-scaled between [0,255] for values falling within [-1.45, 0.0]) into the blue and green color guns of said composite, wherein the resultant imagery rendered depicts atmospheric dust as visually enhanced features.